A STUDY ON KNOWLEDGE, PERCEPTION AND PRACTICE (KPP) OF PREVENTIVE MEASURES AGAINST RESPIRATORY TRACT INFECTIONS, FACTORS ASSOCIATED WITH HAND HYGIENE PRACTICES AND THE EFFECT OF SUPPLYING HANDRUB AMONG MALAYSIAN HAJJ PILGRIMS 2013

By

DR ZETI NORFIDIYATI BINTI SALMUNA@ AYUB

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ABBREVIATIONS

ARIs	Acute respiratory infections
CDC	Centres for Disease Control and Prevention
CI	Confidence interval
ILI	Influenza-like illness
JEPeM	Jawatankuasa Etika Penyelidikan Manusia
KPP	Knowledge, Perceptions and Practices
KPP-PMQ	Knowledge, Perception And Practice of Respiratory Infection Preventive Measure Questionnaire
KSA	Kingdom of Saudi Arabia
MOH	Ministry of Health
NHS	National Health Service
NMRR	National Medical Research Register
NPIs	Non-pharmaceutical interventions
pbuh	Peace been upon him
PSI	Penyakit seperti influenza
SARS	Severe acute respiratory syndrome
SD	Standard deviation
SICU	Surgical Intensive Care Unit
WHO	World Health Organization

ABSTRACT

A STUDY ON KNOWLEDGE, PERCEPTION AND PRACTICE (KPP) OF PREVENTIVE MEASURES AGAINST RESPIRATORY TRACT INFECTIONS, FACTORS ASSOCIATED WITH HAND HYGIENE PRACTICES AND THE EFFECT OF SUPPLYING HANDRUB AMONG MALAYSIAN HAJJ PILGRIMS 2013

Dr Zeti Norfidiyati Salmuna @ Ayub

MMed Pathology (Microbiology)

Department of Microbiology and Parasitology

School of Medical Sciences, Universiti Sains Malaysia

Health Campus, 16150 Kelantan, Malaysia

Introduction: Every year, approximately 2 million pilgrims from all over the world gathered in Mecca to participate in Hajj, one of the pillar of Islam. Extreme congestion of people and heat represent an important risk for local or widespread outbreak of infectious diseases. Acute respiratory infections (ARIs) are the most common cause of hospital admission during hajj. Respiratory illness refers to influenza-like illness (ILI) defined as the presence of fever and cough with and without other respiratory symptoms; nasal congestion, sore throat, sneezing or breathing problems.

Protective behaviors such as using facemask, frequent usage of handrub, cough etiquette, social distancing and contact avoidance have been used to prevent its spread. Previous studies showed that hajj pilgrims that engaged in the recommended protective behaviors particularly hand hygiene and social distancing to have lower rate of

respiratory illness, less severe and shorter duration of illness compared with those who don't adhere to the recommended protective behaviors.

Objectives: The aim of this study is to determine the knowledge, perception and practice (KPP) of preventive measures against respiratory tract infections, factors associated with hand hygiene practices and the effect of supplying handrub among Malaysian hajj pilgrims 2013.

Materials and Methods: This is an open-label randomized controlled trial which was conducted to Malaysian hajj pilgrims who transit in Kompleks Tabung Haji Kelana Jaya, Malaysia from 15 to 19 September 2013. The hajj pilgrims were randomized according to the flight batch (KT). Intervention group was part of hajj pilgrims from KT 24, 25, 27, 30, 40, and 47. Control group was part of hajj pilgrims from KT 31,33,35,36,44,57,66. A total of 500 hajj pilgrims involved in this study (250 in intervention group and another 250 in control group). They were given two sets of self-administrated validated Knowledge, Perception And Practice of Respiratory Infection Preventive Measure Questionnaires **(KPP-PMQ)** to be filled up before and during hajj to assess the baseline knowledge, attitude and practice of protective measures of acute respiratory infections (ARIs) and compared them with post intervention. This Knowledge, Perception And Practice of Respiratory Infection Preventive Measure Questionnaire consist of three (3) main domains and twenty-nine (29) items. Maximum score for knowledge, perception and practice scores were 24, 35 and 70 respectively. Each pilgrim in the intervention group was given four bottles of alcohol-free handrub (100mls per bottle), a pamphlet and demonstration on how to use the handrub. Each pilgrim in the control group was given a bottle of 100ml unmedicated hand lotion. Data

on presence or absence of acute respiratory symptoms and influenza like illness were recorded. Both groups were followed-up in Mecca, Mina and Madinatul Hujjaj where lost questionnaires were replaced. The post- hajj questionnaire was collected at Mecca and by postage after coming back to Malaysia.

Results: Pre -hajj Knowledge, Perception And Practice of Respiratory Infection Preventive Measure Questionnaire were completed by all participants (n=500). Post-hajj Knowledge, Perception And Practice of Respiratory Infection Preventive Measure Questionnaire were completed and returned by (37.6%) n=94 participants in intervention group and (31.2%) n=78 participants in control group. Socio-demographically, both groups were comparable.

There were reduction in percentage of frequent handrub practice (daily practice) 10.2% in intervention group and 9.1% in control group compared with pre-hajj handrub practice. There were significant association between influenza-like illness (ILI) occurrence with hand hygiene practices during hajj. Hajj pilgrims with infrequent handwash after in contact with personal belongings of infected pilgrims are at 2.56 higher odds of getting influenza-like illness (ILI) compared to frequent handwash. Besides, hajj pilgrims with infrequent handwash after in contact with hands of infected pilgrims are at 2.18 higher odds of getting ILI compared to frequent handwash. Hajj pilgrims with infrequent handrub practice using antiseptic handrub were at 3.63 higher odds of getting ILI compared to infrequent handrub.

The knowledge that ILI spread was fast was statistically significant (p= 0.019) between pre-hajj and post-hajj. Regarding the wearing of facemasks by infected people, there was a significant difference (p-value = 0.009) between pre and post hajj that

perceived it as an effective precautionary method. However, regarding behavioural and humanity aspects, there was a significant reduction in those who perceived that doing more charity in Mecca (*p*-value: 0.009) and being calm in handling problems in Mecca (*p*-value: 0.014) were effective precautionary methods. The mean (SD) knowledge, perception and practice scores during hajj with ILI versus non-ILI were 20.6(1.91) versus 20.8(1.98), 28.7(3.66) versus 29.9(3.52), 51.6(6.05) versus 50.7(5.72) respectively. Only the mean difference of perception score was found to be significant with the presence of ILI (p= 0.026, 95% CI: -2.354, -0.150). There is no mean difference of knowledge and practice scores with the presence of ILI.

Conclusion: In conclusion, giving handrub has not resulted in better compliance. Hajj pilgrims perception during hajj does affect the presence of ILI . Infrequent hand hygiene practices were associated with higher risk of getting ILI. There are significant changes in knowledge and perceptions of Malaysian hajj pilgrims pre and post-hajj concerning the spread and preventative measures of influenza-like illnesses.

Prof Dr Habsah Hasan: Supervisor

Dr Aniza Abdul Aziz:Co- Supervisor

ABSTRAK

KAJIAN TERHADAP TAHAP PENGETAHUAN, PERSEPSI DAN AMALAN MENGENAI LANGKAH PENCEGAHAN PENYAKIT JANGKITAN SALURAN PERNAFASAN, FAKTOR-FAKTOR YANG MEMPENGARUHI AMALAN PENJAGAAN KEBERSIHAN TANGAN, DAN KESAN PEMBERIAN PENCUCI TANGAN ANTISEPTIK DALAM KALANGAN JEMAAH HAJI MALAYSIA 2013

Dr Zeti Norfidiyati Salmuna @ Ayub

MMed Patologi (Mikrobiologi)

Jabatan Mikrobiologi dan Parasitologi

Pusat Pengajian Sains Perubatan, Universiti Sains Malaysia

Kampus Kesihatan, 16150 Kelantan, Malaysia

Pengenalan: Setiap tahun dianggarkan 2 juta Jemaah haji dari seluruh dunia berkumpul di Mekah untuk menunaikan haji, iaitu salah satu daripada rukun Islam. Keadaan yang sesak dan cuaca panas adalah risiko utama penyebaran penyakit berjangkit. Penyakit jangkitan saluran pernafasan akut adalah penyebab utama kemasukan ke hospital semasa haji. Penyakit jangkitan saluran pernafasan merujuk kepada penyakit menyerupai influenza (PSI) iaitu gejala demam dan batuk sama ada datang bersama dengan hidung tersumbat, sakit tekak, bersin atau masalah pernafasan.

Langkah pencegahan seperti memakai penutup mulut dan hidung, penggunaan pencuci tangan antiseptik dengan kerap, mengamalkan etika batuk, menjarakkan diri

dan mengelakkan sentuhan telah digunakan untuk mengelakkan penyebaran penyakit jangkitan saluran pernafasan. Keputusan kajian terdahulu menunjukkan jemaah haji yang melakukan langkah pencegahan terutama menjaga kebersihan tangan dan menjarakkan diri dari Jemaah yang berpenyakit, kurang mendapat penyakit jangkitan saluran pernafasan, penyakit mereka kurang teruk dan sembuh dalam jangka masa yang pendek berbanding jemaah haji yang tidak melakukan langkah pencegahan tersebut.

Objektif: Tujuan kajian ini adalah untuk mengenalpasti tahap pengetahuan, persepsi dan amalan mengenai langkah pencegahan penyakit jangkitan saluran pernafasan, faktor-faktor yang mempengaruhi amalan penjagaan kebersihan tangan dan kesan pemberian pencuci tangan antiseptik dalam kalangan Jemaah haji Malaysia tahun 2013.

Bahan dan Kaedah: Ini adalah kajian label-terbuka kajian rawak terkawal yang telah dilakukan kepada jemaah haji Malaysia yang berada di Kompleks Tabung Haji Kelana Jaya pada 15 hingga 19 September 2013. Jemaah haji dibahagikan secara rawak berdasarkan pada kumpulan penerbangan (KT). Kumpulan intervensi adalah sebahagian daripada jemaah haji dari KT 24,25,27,30,40 dan 47. Kumpulan kontrol adalah sebahagian daripada Jemaah haji dari KT 31,33,35,36,44,57 dan 66. Seramai 500 Jemaah haji terlibat di dalam kajian ini (250 di dalam kumpulan intervensi dan 250 di dalam kumpulan kontrol). Jemaah haji diberikan dua borang soal-selidik yang telah divalidasi berkaitan pengetahuan, tanggapan dan amalan berkenaan pencegahan penyakit jangkitan saluran pernafasan untuk diisi sendiri sebelum dan semasa mengerjakan haji untuk mengenal pasti asas pengetahuan, tanggapan dan amalan mereka sebelum menunaikan haji dan membandingkan dengan selepas haji antara

kedua-dua kumpulan. Borang soal-selidik berkaitan tahap pengetahuan, tanggapan dan amalan mengandungi tiga (3) domain utama dan (29) item. Skor maksimum untuk pengetahuan, persepsi dan amalan adalah masing-masing 24, 35 dan 70. Setiap jemaah dalam kumpulan intervensi diberikan empat (4) botol pencuci tangan antiseptik tanpa alkohol (100ml/botol), risalah kaedah pencucian tangan dan demonstrasi penggunaan pencuci tangan tersebut. Setiap Jemaah dalam kumpulan kontrol diberikan 100mls losyen tangan tanpa antiseptik. Data berkaitan gejala penyakit jangkitan saluran pernafasan akut dan PSI direkodkan sendiri oleh jemaah. Kedua-dua kumpulan dipantau di Mekah, Mina dan Madinatul Hujjaj dan borang soal-selidik yang hilang telah diganti. Borang soal-selidik yang lengkap diisi di kumpulkan di Mekah dan dihantar melalui pos sekembalinya jemaah haji ke Malaysia.

Keputusan: Borang soal-selidik yang diberikan sebelum menunaikan haji diisi dan dikembalikan oleh 500 jemaah haji. Borang soal-selidik yang diisi semasa haji diisi dan dipulangkan oleh (37.6%) n=94 Jemaah haji dari kumpulan intervensi dan (31.2%) n=78 Jemaah haji dari kumpulan kontrol. Taburan sosio-demografi kedua-dua kumpulan adalan setara.

Terdapat penurunan di dalam peratusan jemaah haji yang kerap menggunakan pencuci tangan antiseptik (setiap hari), 10.2% di dalam kumpulan intervensi dan 9.1% di dalam kumpulan kontrol jika dibandingkan dengan amalan sebelum haji. Terdapat hubung-kait yang signifikan di antara terjadinya PSI dengan amalan penjagaan kebersihan tangan . Jemaah haji yang tidak kerap mencuci tangan selepas bersentuhan dengan peralatan peribadi Jemaah yang dijangkiti PSI adalah 2.56 lebih tinggi kemungkinan untuk mendapat PSI jika dibandingkan dengan mereka yang kerap

mencuci tangan. Disamping itu, jemaah haji yang tidak kerap mencuci tangan selepas menyentuh tangan Jemaah haji yang dijangkiti adalah 2.18 lebih tinggi kemungkinan untuk mendapat PSI jika dibandingkan dengan mereka yang tidak kerap mencuci tangan. Jemaah haji yang tidak kerap menggunakan pencuci tangan antiseptik adalah 3.63 lebih tinggi kemungkinan untuk mendapat PSI jika dibandingkan dengan jemaah haji yang kerap menggunakannya.

Tahap pengetahuan mengenai PSI merebak dengan pantas adalah signifikan sebelum dan selepas haji (nilai P= 0.019). Mengenai memakai penutup mulut dan hidung oleh jemaah yang dijangkiti PSI juga adalah signifikan (nilai P=0.009) antara sebelum dan selepas haji. Akan tetapi, mengenai sikap dan faktor kemanusiaan, penurunan yang signifikan dicatatkan kepada jemaah haji yang percaya bahawa banyak bersedekah di Mekah (nilai P=0.009) dan bertenang ketika menghadapi sebarang masalah di Mekah (nilai P=0.014) sebagai langkah pencegahan yang berkesan. Purata (sisihan piawai) skor pengetahuan, tanggapan dan amalan semasa haji untuk PSI berbanding bukan-PSI adalah 20.6 (1.91) berbanding 20.8 (1.98), 28.7 (3.66) berbanding 29.9 (3.52), 51.6 (6.05) berbanding 50.7 (5.72) masing-masing. Hanya perbezaan purata skor tanggapan didapati signifikan dengan terjadinya PSI (nilai-p =0.025, 95%CI: -2.354,-0.150). Perbezaan purata skor pengetahuan dan amalan adalah tidak signifikan dengan terjadinya PSI.

Kesimpulan: Kesimpulannya, pemberian pencuci tangan antiseptik tidak menyebabkan peningkatan penggunaan bahan ini. Tanggapan jemaah haji semasa haji mempengaruhi terjadinya PSI. Jemaah haji yang tidak kerap mengamalkan penjagaan kebersihan tangan lebih berisiko untuk mendapat PSI. Terdapat perubahan yang

signifikan pada tahap pengetahuan dan persepsi jemaah haji Malaysia sebelum dan selepas haji berkenaan penyebaran dan langkah-langkah pencegahan PSI.

Prof Dr Habsah Hasan: Supervisor

Dr Aniza Abdul Aziz:Co- Supervisor

CHAPTER 1: INTRODUCTION

1.1 Background of the study

Every year, more than two millions Muslim from over 180 countries gather at Mecca to perform hajj (Ahmed *et al.*, 2006a; Mansoor, 2009) including with approximately 27 000 hajj pilgrims from Malaysia. Approximately 60% of them will acquire respiratory symptoms during hajj or after coming back to their hometown (Deris *et al.*, 2010; Gautret *et al.*, 2011).

Acute respiratory infections (ARIs) caused approximately 2 million deaths a year (Guerrant & Blackwood 1999); WHO 2002). Respiratory illness is the major cause of hospital admission during pilgrimage (Al-Ghamdi *et al.*, 2003; Madani *et al.*, 2006; Madani *et al.*, 2007). Such a huge crowds impose a risk for local or worldwide spread of communicable diseases outbreak and raised concern regarding emerging of severe acute respiratory syndrome such as pandemic influenza during this mass gathering (Rashid *et al.*, 2008a).

Respiratory tract infection was defined as presence of at least one constitutional symptoms (fever,headache and myalgia) plus at least one of the local symptoms (runny nose, sneezing, throat pain, and cough with or without sputum) (AlMudmeigh *et al.*, 2003; Abdin *et al.*, 2005; Al-Asmary *et al.*, 2007). Acute respiratory infection was defined as cough, nasal congestion, rhinorrhea or sore throat with or without fever(Mitchell *et al.*, 2011).

Influenza- like illness (ILI) was defined by the Centers for Disease Control and Prevention (CDC) as ‘ temperature of $\geq 37.8°C$ and either cough or sore throat

in the absence of a known cause other than influenza (Thursky *et al.*, 2003; Babcock *et al.*, 2006; Rashid and Rafiq, 2006). However, because of the lower sensitivity of the CDC criteria, the triad of cough, subjective fever and fatigue was suggested to define ILI (Thursky *et al.*, 2003; Babcock *et al.*, 2006; Rashid and Rafiq, 2006). For hajj pilgrimage, self-reported fever, with cough or sore throat was used to define ILI (Biggerstaff *et al.*, 2012).

Extended and prolonged stays in a densely packed crowds and extreme physical stressors such as heat with day-time temperature approaching 50°C impose a significant health risk to hajj pilgrims, especially the potential spread of infectious diseases particularly respiratory infections. The preventive measures such as supplements, facemask, vaccination, hand hygiene and health education is therefore a collective responsibility.

The battle against spread of communicable diseases particularly respiratory infections are beyond the responsibilities of the host's nation. These infections or outbreak are avoidable if preventive and prophylactic measures are implemented before and during hajj. Hand hygiene, wearing a face mask, cough etiquette, social distancing and contact avoidance can be part of effective preventive behavioural interventions in mitigating respiratory illness among Hajj pilgrims (CDC, 2014).

Preparing the hajj pilgrims before going to Hajj is critical. The collaborative efforts between Tabung Haji Malaysia and Ministry of Health (MOH) Malaysia is important to ease hajj pilgrims journey prior hajj and during hajj in Saudi Arabia. Thus, all pilgrims need to undergo health screening before going for hajj to identify any pre-existing illnesses such as chronic lung disease, hypertension, diabetes

mellitus, heart disease , renal disease and etc. Tabung Haji Malaysia works hand in hand with Ministry of Health (MOH) Malaysia to ensure that hajj pilgrims are fit for this once in this lifetime journey.

In one study conducted among France Hajj pilgrims, they showed that less than 50% respondents were aware of social distancing, curative treatment and face mask use as precautionary measures to reduce the spread of respiratory infection (Gautret *et al.*, 2009c) . Promotion and distribution of face mask increased their use from 34% to 81% in one cohort of Saudi pilgrims (Abdin *et al.*, 2005). Maintaining good hand hygiene is an effective way to reduce spread of respiratory infection. World Muslim League has issued a fatwa allowing use of alcohol-based handrub on skin as disinfectants (Ahmed *et al.*, 2006b).

A study among Saudi public to identify awareness, attitudes and practices related to Influenza A H1N1 showed that high concern did not translate into a higher compliance with precautionary recommendations possibly due to the low level of knowledge about the disease among the public (Balkhy *et al.*, 2010). However, one study among nurses showed that good knowledge was not reflected to their practices level of infection control (Egwuenu and Okanlawon, 2014).

In a recent review of behavioral responses to influenza pandemics in the 20th century (Balinska and Rizzo, 2009), the only two measures that had strong support by scientific literature to lessen the spread of respiratory illness were hand hygiene and respiratory etiquette. Poor understanding of the disease and its transmission explained why high level of concern did not translate into a higher compliance with preventive measures (Leavitt, 2003). Korean university students increased their

frequency of hand hygiene practice during the pandemic of Influenza A H1N1 as a mean of disease prevention (Park *et al.*, 2010).

A study by Balaban et al toward 2009 Hajj pilgrims from Michigan and Minnesota reported that pilgrims who practiced contact avoidance, social distancing and hand hygiene during the hajj reported less respiratory illness (Balaban *et al.*, 2012a).

Thus, the aim of this study is to assess the knowledge, perception and practice of hand hygiene, its associated factors and the effect of supplying handrub to promote hand hygiene practices in preventing respiratory tract infections among Malaysian hajj pilgrims

1.2 Literature review

1.2.1 Introduction on Hajj Rituals

Hajj pilgrimage to Mecca, Saudi Arabia is one of the five fundamental pillars of Islam. It is once in a lifetime obligation for those Muslims with adequate means and health. In Malaysia, pilgrims were brought to Mecca by a governmental body, Tabung Haji Malaysia in co-operation with few private agencies.

Upon arrival at Mecca, the hajj journey begins with circumambulating the Ka'aba (first *tawaf*) at the Great Mosque, in Mecca (Benkouiten *et al.*, 2013). The Ka'aba is the most sacred place for muslims. Hajj pilgrims will perform a *tawaf*, circling the Ka'aba 7 times counterclockwise. Because of the overcrowding with huge number of people, even one *tawaf* can take hours to be completed (CDC, 2014).

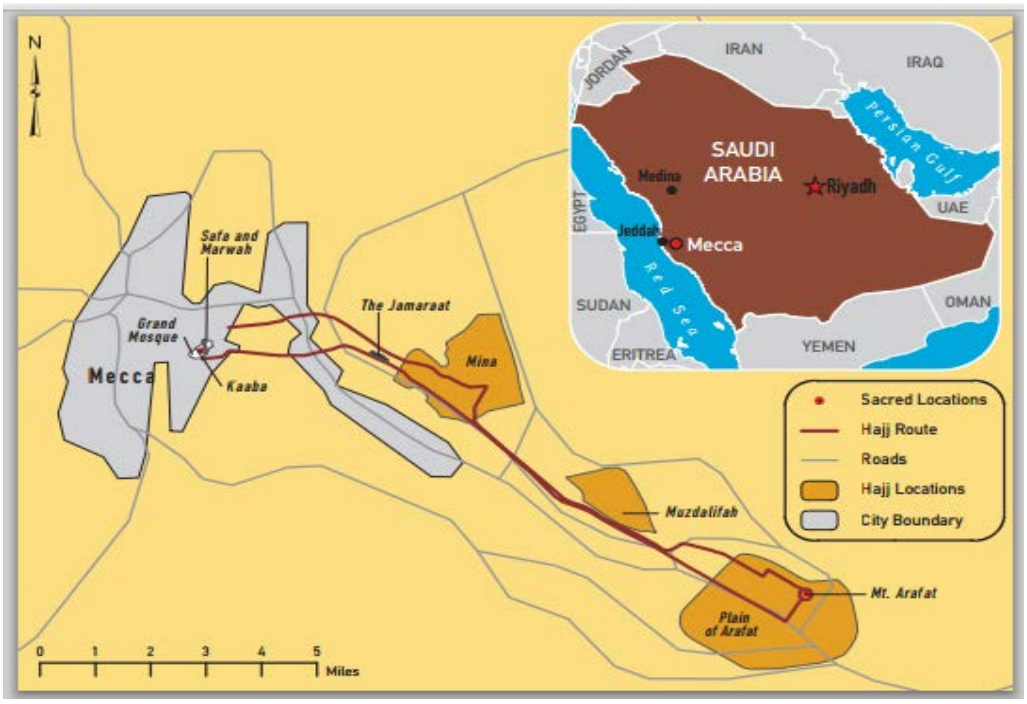

Figure 1 : Hajj Destination Map (Adapted from CDC, 2014)

Beside *tawaf,* pilgrims performed *sa'i,* walking or running 7 times between the hills of Safa and Marwah. This route is now an air-conditioned tunnel that have separate sections for runners, walkers and disabled pilgrims.

The hajj pilgrims will stay at Mina campment for one night. Later, they will gather at the Valley of Arafat for standing prayer. Valley of Arafat is the most crowded area whereby most pilgrims will gather there at the same time. Hajj pilgrims spend the day in Arafat with supplication, praying and reading The Holy-Quran.

Then, they will move to Muzdalifah to gather stones for stoning the devils at the Jamaraat Pillars in Mina. Jamaraat Pillars in a wider, multi-level bridge is another place with the densest crowd of people. Hajj pilgrims threw 7 tiny pebbles which is no larger than a chickpea at each of the three white pillars with a total of 21 pebbles.

Traditionally after Jamaraat, hajj pilgrims will sacrifice an animal to symbolize the ram that Abraham prophet (pbuh) sacrificed instead of his son Ismail prophet (pbuh). These sacrificed was done by a centralized licensed body on behalf of the hajj pilgrims and the meat was distributed later.

After that, hajj pilgrims will then circumbulating the Kaaba again for final *tawaf* in Mecca. After completed the hajj rituals, the hajj pilgrims will travel to Madinah to visit the Mosque of the Prophet. Although it is not part of hajj ritual, many of them the will extend their trip to visit the grave of Mohammed prophet

(pbuh) in Madinah which is the second holiest place for Muslims in Islam. The overview of Hajj pilgrimage route is described in the picture below.

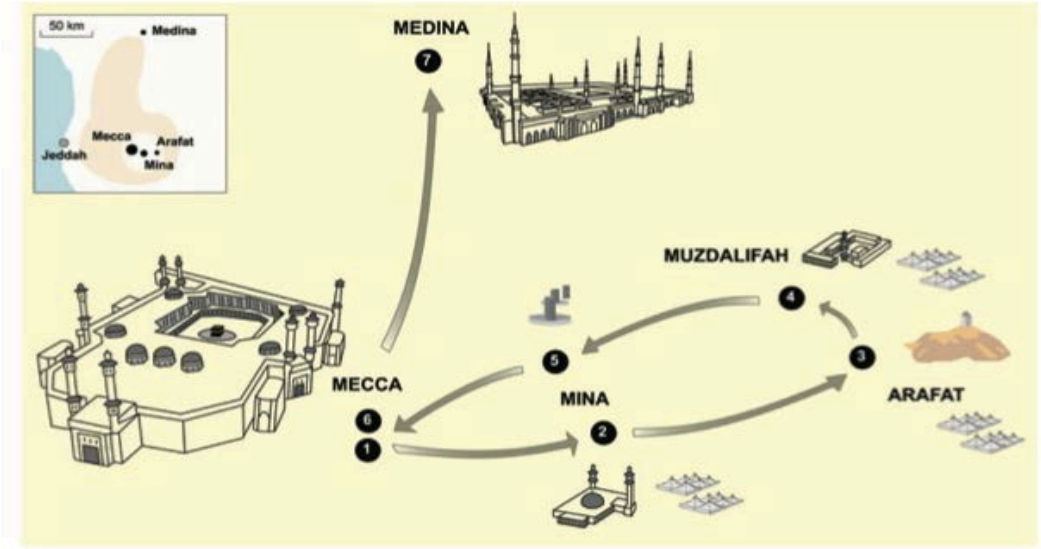

Figure 2: Overview of the Hajj Pilgrimage Route . 1: Circumambulating the Kaaba (first Tawaf) at the Great Mosque,in Mecca. 2: Staying at the Mina tent encampment. 3: Standing prayer in the Valley of Arafat. 4: Gathering stones at Muzdalifah. 5: Stoning the Devil at the Jamaraat pillars in Mina. 6: Circumambulating the Kaaba again (second Tawaf) in Mecca. 7: Visiting the Mosque of the Prophet at Medina.

(Adapted from Benkouiten *et al.*, 2013)

1.2.2 Respiratory tract infections among Hajj pilgrims

Mass religious event such as hajj that attract worldwide pilgrims serve as an effective mode of transmission of infectious diseases between pilgrims. Infectious diseases such as gastrointestinal infections, respiratory infections, arboviral infections,

parasitic, fungal and other infections was easily passed from one pilgrim to another due to crowded accommodation, congregation and prayers as well as physical stressors such as heat, sun exposure, thirst, steep inclines and rough ground underfoot (Shafi *et al.*, 2008; Memish *et al.*, 2014b).

The commonest diagnosed diseases were acute respiratory infections and gastrointestinal illnesses. Cough, dyspnea and fever were the commonest patients's complaints among Hajj pilgrims attending Mina Hospitals in 2007 hajj season (Khamis, 2008). Among these, cough was the commonest symptom reported by hajj pilgrims (Gautret *et al.*, 2009a; Gautret *et al.*, 2009d; Imani *et al.*, 2013).

The severity of respiratory infection varies from mild illness to severe pneumonia leading to hospitalization and death (Madani *et al.*, 2006). Tuberculosis, pertussis, influenza as well as other viruses have been widely reported among hajj pilgrims (Alzeer *et al.*, 1998; Wilder-Smith *et al.*, 2003; Rashid *et al.*, 2008c). The most common vaccine- preventable respiratory virus infection identified and documented among Hajj pilgrims is influenza (Balkhy *et al.*, 2004).

Emerging respiratory illnesses such as MERS-CoV and Ebola may mimic ILI. Even though The WHO recommends the screening of pilgrims for MERS-CoV, a study among symptomatic Austria hajj pilgrims in 2014 ceased to find the infection, instead influenza A and B predominate (Aberle *et al.*, 2014). Another study among French hajj pilgrims in 2013 also showed a lack of MERS-CoV but a high prevalence of the influenza virus (Gautret *et al.*, 2014). Furthermore, there is no evidence of MERS-CoV nasal carriage detected among French hajj pilgrims(Gautret *et al.*, 2013) returning from the hajj in 2012 as well as among 5235 hajj pilgrims in the Kingdom of Saudi Arabia in

the 2013 hajj season (Memish *et al.*, 2014a). There was a high prevalence of common respiratory viruses such as human rhinovirus (HRV), respiratory syncytial virus (RSV) and influenza A, however no evidence of MERS-CoV was found in Ghana hajj pilgrims during the 2013 hajj season (Annan *et al.*, 2015).

1.2.3 Preventive measures of respiratory tract infections

World Health Organization (WHO) recommended non-pharmaceutical interventions such as social distancing by avoiding crowded conditions, and personal protection (i.e wearing facemasks) and hygiene measures (i.e respiratory hygiene/ cough etiquette and proper handwashing) for pandemic influenza prevention (WHO, 2006). However, to avoid crowded conditions during hajj was almost impossible.

Saudi Arabia Ministry of Health recommends seasonal influenza vaccination especially in high risk pilgrims such as those with chronic diseases and in extreme age group (more than 65 years of age and less than 5 years old) for influenza prevention (*18 circular: health requirements for pilgrims of hajj 2014*). However, the effectiveness of influenza vaccine was not demonstrable in few studies (Razavi and Salamati, 2005). This may suggest to consider other pathogens as causes of ILI such as adenoviruses, RSV, β-haemolytic *Streptococcus*, *Haemophilus* species, Gram-negative bacilli, *Legionella pneumophila* and Chlamydia (Razavi *et al.*, 2007). Besides, the awareness and uptake of seasonal influenza vaccination was low (Fatema *et al.*, 2015). The vaccine uptake was variable, which is more than 70% in Malaysian hajj pilgrims (Deris *et al.*, 2010), but lower in French hajj pilgrims (Gautret *et al.*, 2007) (33%), British hajj pilgrims (Rashid *et al.*, 2008b) (27.7%) and Iranian hajj pilgrims (Razavy and Ardekani, 2004) (10.7%). Other possible reason why influenza does not protect

from ILI may be due to influenza vaccine strain does not match the circulating strain causing doubtful efficacy of the vaccine based on different strains found in different year according to several studies in 2003 (Balkhy *et al.*, 2004) , 2004 (AlSaleh *et al.*, 2005) and 2005 (Rashid *et al.*, 2008b) hajj seasons. Influenza vaccine effectiveness was variable, however, pooled meta-analysis from six studies showed that influenza vaccine was significantly effective against laboratory-confirmed influenza (Alqahtani *et al.*, 2015a).

Several studies showed that wearing facemasks either offered no significant protection or were associated with prolonged duration of fever and sore throats (Al-Shehry and Al-Khan, 1999; Al-Asmary *et al.*, 2007; Gautret *et al.*, 2009a; Deris *et al.*, 2010; Gautret *et al.*, 2011; Balaban *et al.*, 2012b). However, other study have found protective effects of wearing facemask at Hajj (Choudhry *et al.*, 2006). Besides, facemask awareness, uptake and compliance varied. A study among Malaysian hajj pilgrims in 2009 showed 78.1% uptake of facemasks (Deris *et al.*, 2010) but whether they used it properly according to face mask usage guideline was doubtful. However, uptake of facemasks among respiratory illness patients attending Mina Hospital was very low, 12.1% (Khamis, 2008). According to CDC guideline (CDC, 2009), facemasks should be used only once and in a correct way to give optimum protection. The hajj pilgrims may wear the same facemask repeatedly which lead to ineffective facemasks protective effect.

Honey and Habbatus Sauda are among the most effective potential supplements in the prevention of respiratory infections (Sulaiman *et al.*, 2011; Forouzanfar *et al.*, 2014). Honey, as a natural product obtained from flowers via honey bees was widely

used by ancient Egyptians and Greeks, proven to have methylglyoxal (MGO) which act as antibacterial, antiviral as well as promoting anti-inflammatory activity (Ghizatullina, 1976; Adams *et al.*, 2008; Mavric *et al.*, 2008; Kwakman *et al.*, 2010; Kwakman and Zaat, 2012; Watanabe *et al.*, 2014; Charyasriwong *et al.*, 2015). Black seed (Habbatus Sauda) was known to have anti-bacterial, anti-viral, anti-fungal, anti-parasitic as well as anti-oxidant properties (Erkan *et al.*, 2008; Bourgou *et al.*, 2012; Forouzanfar *et al.*, 2014). Therefore, black seed as well as honey are considered natural remedies for the prevention of influenza-like illnesses.

According to a review on behavioral responses to influenza pandemics in the 20^{th} century, hand hygiene and respiratory etiquette are the only two preventive measures that was strongly supported by scientific literature to lessen the spread of influenza (Balinska and Rizzo, 2009). Guidelines from CDC (CDC, 2009; CDC 2009) and WHO (WHO, 2009) were used to mitigate the impact of Influenza A (H1N1) during mass events such as hajj pilgrimage. Social distancing, hand hygiene and contact avoidance were the three protective behaviors that were associated with reduced risk of respiratory tract infection among US hajj pilgrims (Balaban *et al.*, 2012b). However, frequency of handwashing varied widely. Only 41.2% hajj pilgrims attending Mina hospital practiced frequent hand washing (Khamis, 2008).

Regarding anti-viral chemoprophylaxis, Zanamivir (Relenza) and Oseltamivir (Tamiflu) are the currently recommended treatment to treat influenza but should be started within 48 hours of symptoms appearance (Cooper *et al.*, 2003). However, high cost of the antivirals limits their usage.

1.2.4 Factors affecting preventive measure practices

Specific behavioural changes related to hygiene has been proved useful to contain infectious disease outbreaks previously (Fung and Cairncross, 2006). The recommendations suggested include using tissues or towels while sneezing, regular hand washing with soap and water, and to set up a network of ‘ flu friends ‘ to assist in term of knowledge sharing if infected with flu illnesses.

A national survey in France regarding perception on pandemic influenza threat showed increase in true belief that non-pharmaceutical interventions such as improved hygiene and social distancing measures are effective to reduce risk of getting the illness, however their inadequate beliefs on influenza transmission and prevention may contribute to the illness (Raude and Setbon, 2009). Only 50% respondents perceived that handwashing as one of preventive measure of influenza (Seale *et al.*, 2009).

Most hajj pilgrims that had poor knowledge regarding preventive measures of ILI (Tabatabaei *et al.,* 2015) particularly hand hygiene willing to comply to hand hygiene practice when they are informed regarding the effectiveness of this preventive measure (Gautret *et al.*, 2009c). A greater precautionary measures were taken by study participants in Riyadh who were male, older, educated and knowledgeable (Balkhy *et al.,* 2010). Female Korean university students who perceived hand washing to be effective and illness severity to be greater during the peak Influenza pandemic period washed their hands more frequently (Park *et al.*, 2010).

A systematic review about the community knowledge, behaviours and attitudes about 2009 H1N1 influenza pandemic noted that awareness of the pandemic was high with moderate knowledge (Tooher *et al.*, 2013). The most commonly reported factors

that have influenced the participants to adopt to certain recommended precautions were increased risk perception, older age, increased knowledge on the pandemic situation and being female (Tooher *et al.*, 2013). Female sex and older age was reported using hygienic measures more frequently (Cowling *et al.*, 2010).

One study in India showed that only one-third respondents have enough knowledge and information regarding Influenza A H1N1 with higher educational level, employment, males and older respondents had significantly higher knowledge (Kamate *et al.*, 2009). Regarding perception, however, females had positive attitudes toward influenza when compared to males even though they were less knowledgeable (Ahmed *et al.*, 2009; Kamate *et al.*, 2009). Only 25% respondents perceived handwashing as effective preventive measure of influenza (Kamate *et al.*, 2009). However, unemployed participants had significantly more positive attitudes compared to those were employed (Kamate *et al.*, 2009).

Women showed perceived higher concern about H1N1 and willing to take precautionary measures compared to men (Ibuka *et al.*, 2010). Perceived risk of precautionary behaviour and infection can be dynamic in time, differ and affected by demographic characteristics of the study participants and also geographical locations that will likely influence the effectiveness of influenza control measures (Ibuka *et al.*, 2010).

Females, older individuals more than 65 years of age and those with tertiary educational level and knew the main modes of transmission had higher perception of risk of influenza and became more compliance with the preventive measures and behaviours (Lin *et al.*, 2011). One study also reported that females, those with higher

education, employment ,as well as those living in urban areas reported higher number of risk avoidances (Wong and Sam, 2011).

Strong intention to comply to preventive measures of influenza in the future was associated with higher age, high perceived severity and anxiety, high perceived efficacy of the preventive measures, high self-efficacy, and finding governmental information to be reliable (Bults *et al.*, 2011). There were reduction in incidence of pneumonia in children less than 5 years old who received hand hygiene education and soap compared to before intervention (Luby *et al.*, 2005).

Media coverage and advertising about swine flu is likely to increase the perceived efficacy of recommended hygiene behaviours, which, in turn, is likely to increase their uptake (Rubin *et al.*, 2010). People who perceived that there is likelihood of catching influenza tended to comply with the recommended behaviours (Jones and Salathe, 2009; Rubin *et al.*, 2009; Prati *et al.*, 2011).

Self-perceived vulnerability and fatality of influenza significantly associated with change in hand washing practice (Sharma *et al.*, 2012). Previous research shows that the perception of efficacy of preventive measures is associated with adopting measures for prevention against SARS, avian flu, and influenza A/H1N1 (Lau *et al.*, 2004; Lau *et al.*, 2007). A very high levels of perception regarding the efficacy of handwashing for influenza A/H1N1 prevention was associated with frequent handwashing (Lau *et al.*, 2010). Appropriate health protective behaviours, may be more likely when fear of the illness was at a moderate level (Wong and Sam, 2011), therefore information communication should attempt to evoke a sense of fear or perceived susceptibility so that a person will adopt recommended health-protective behaviors.

A study showed that hajj pilgrims that received pre-hajj health education regarding wearing facemask and hand hygiene complied to the protective measures compared to those who did not received health education prior to hajj (Khamis, 2008).

1.2.5 Hand hygiene preference as preventive measure of respiratory tract infection

Centers for Disease Control and Prevention (CDC) recommendations for prevention of ILI included advice to practice respiratory etiquettes, to wash hands or use an alcohol-based hand sanitizer frequently, wearing facemask in public and to minimize contact with infected person as much as possible (CDC, 2009). These non-pharmaceuticals interventions (NPIs) are recommended to decrease the number of cases and to reduce the spread of the disease.

Other preventive measures recommended before going for hajj are influenza vaccination as recommended by few studies (Balkhy *et al.*, 2004; Barasheed *et al.*, 2014) as well as Ministry of Health of Saudi Arabia (CDC, 2014; MOH Saudi Arabia, 2014) and together with rapid anti-viral therapy for symptomatic pilgrims (Haworth *et al.*, 2013) , taking supplements such as vitamins, black seed (Habbatus Sauda) (Amin G, 1991; FILIPPO *et al.*, 2002; Gaur, 2015) as well as honey (Sulaiman *et al.*, 2011).

However, many studies have reported improvements in hand hygiene have significant association with reduction of infectious illnesses rate in the community as well as reduces spread of infectious illnesses in the society (Aiello and Larson, 2002).This was supported by a study among domestic and international university students from Sydney, Australia that nominated hand washing as the most feasible and acceptable preventive measures as compared with social distancing and mask use (Seale *et al.*, 2012).

Hand hygiene was the most reported protective behaviour during hajj among United States hajj pilgrims during 2009 hajj season compared to wearing face mask, cough etiquette, social distancing and contact avoidance (Balaban *et al.*, 2012b). Two third of Australian hajj pilgrims practiced hand hygiene either with water, soap or alcoholic hand disinfectant when they perceived that the method was very effective compared to face mask use and avoiding contact with ill people (Alqahtani *et al.*, 2015b).

Most local head departments (70-90%) in United States recommended hand hygiene, and cough etiquette compared to voluntary isolation of ill patients (Cantey *et al.*, 2013) for non-pharmaceutical interventions (NPIs) during pandemic influenza 2009. The usage of non-antibacterial soap or antibacterial soap combined with hand-hygiene education had the strongest protective effect on the rate of respiratory illness (Luby *et al.*, 2005).

Approximately 96% students and faculty staffs of a public university in United States increased their hand washing practice with more than 65% of them used hand sanitizer as self-protective non-pharmaceutical intervention during pandemic influenza outbreak compared to other non-pharmaceutical interventions (Mitchell *et al.*, 2011).

More than 98% teachers and care givers in eight elementary schools in United States have instructed the children or students to wash hand more frequently as preventive measure of pandemic influenza A H1N1 (Shi *et al.*, 2014). Handwashing and hand sanitizer usage were highly acceptable by adults and school children during seasonal influenza outbreaks compared to wearing masks and gloves as general etiquette practice (Stebbins *et al.*, 2009).

Respondents in one study in Mexico (> 75%) reported frequent hand washing with soap and water as community mitigation effort against H1N1 in Mexico compared to other non-pharmaceutical interventions (NPIs) (Aburto *et al.*, 2010). Most respondents (59.7%) reported frequent hand washing undertook during seasonal influenza compared to other NPIs or influenza vaccination (Setbon *et al.*, 2011).

1.2.6 Effect of hand hygiene practices

Hands are considered as disease vectors, became carriage of respiratory pathogens shed from the nose, mouth or anus to nasal mucosa, conjunctiva (Hendley *et al.*, 1973), or mouth (WHO,2003) of new hosts. Therefore, washing hands with soap either plain or anti-bacterial(Faix, 1987; Ansari *et al.*, 1989; Luby *et al.*, 2001; Gibson *et al.*, 2002; Montville *et al.*, 2002; Larson *et al.*, 2003) is an effective(Curtis and Cairncross, 2003; Alqahtani *et al.*, 2015b), feasible (Khan, 1982; Stanton and Clemens, 1987; Pinfold and Horan, 1996; Curtis *et al.*, 2001; Alqahtani *et al.*, 2015b), and cost-effective method (Borghi *et al.*, 2002) to cleanse hands from bacteria and viruses and may become a successful and promising intervention against acute respiratory infections (ARIs).

Besides, handwashing is a known infection control measure to reduce respiratory infection in healthcare settings (Isaacs *et al.*, 1991; Falsey *et al.*, 1999; Makris *et al.*, 2000) and its spread. Optimal handwashing was defined as handwashing for more or equal to 20 seconds for at least 5 times per day (Aeillo *et al*.2010). Although the recommended optimal duration of handwashing is at least 30 seconds up

to 1 minute, several studies showed that it was seldomly performed (Gould, 1994; Lund *et al.*, 1994; Coignard *et al.*, 1998).

A cluster randomized trial done in Berlin, Germany suggested that household transmission of influenza can be reduced by the use of non-pharmaceutical interventions (NPI), such as facemasks and intensified hand hygiene, when implemented early and used diligently (Suess *et al.*, 2012).

A randomised control trial done in France suggest that during patient care, handrubbing with an alcohol based solution is significantly more efficient in reducing hand contamination than handwashing with antiseptic soap (Girou *et al.*, 2002). Proper handwashing practices manage to reduce the spread of infectious diseases during peak cold and flu season in a child-care centre (Niffenegger, 1997).

There are numerous controlled studies that showed protective effect of hand hygiene in reducing upper respiratory tract infections (Doebbeling *et al.*, 1992; Niffenegger, 1997; Carabin *et al.*, 1999; Falsey *et al.*, 1999; White *et al.*, 2003; Luby *et al.*, 2005; Sickbert-Bennett *et al.*, 2005; Bell *et al.*, 2006).

Even though many studies showed that antimicrobial handwash did not offer advantage over soap and water (Larson *et al.*, 1986; Kotch *et al.*, 1994; Ferson, 1997; Falsey *et al.*, 1999; Zaragoza *et al.*, 1999; Bloomfield, 2001; Picheansathian, 2004; Sandora *et al.*, 2005; Bell *et al.*, 2006), however, with adequate educational program about hand hygiene and respiratory practices as well as provision of antimicrobial handwash, it reduced incidence of influenza illness as suggested by few studies (Stebbins *et al.*, 2011; Talaat *et al.*, 2011).

Frequency of daily hand washing more than 10 times per day or 5-10 times per day were protective factors for the prevention of influenza requiring hospitalization in a multi-center case control study in 36 hospitals in Spain (Godoy *et al.*, 2012). Intensive hand washing promotion as well as provision of soap can reduce diarrhoeal and respiratory disease among Chinese primary school children (Bowen *et al.*, 2007).

1.2.7 Hand hygiene practices for hajj pilgrims

The 16th meeting of the Muslim Scholars' Board of the World Muslim League in Mecca, Saudi Arabia, in January 2002 recommend that medicines that contain alcohol is permitted if no substitute exists (Ahmed *et al.*, 2006b). As a result, alcohol-based hand rub has been installed in more than 200 public hospitals in Saudi Arabia since 2003 and tolerable to most Muslim health care workers (Ahmed *et al.*, 2006b).

A study among Indian hajj pilgrims 2014 showed that compliance to hand hygiene was highest compared to other preventive practices such as cough etiquette or wearing face mask and it was significantly associated with lower prevalence of ILI among hajj pilgrims (Fatema *et al.*, 2015).

1.3 Aim of the study

Thus, the aim of this study is to determine modifiable protective factors such as knowledge, perception and hand hygiene practices that can be incorporated into hajj modules later to prevent respiratory tract infections among hajj pilgrims as well as to determine the compliance to hand rub usage and its effectiveness in preventing respiratory tract illnesses among hajj pilgrims.

1.4 Objectives

1.4.1 General objective

General objective of this study is to assess the knowledge, perception and practice of hand hygiene, its associated factors and the effect of supplying handrub in preventing respiratory tract infections among Malaysian hajj pilgrims.

1.4.2 Specific objective

Specific objectives of this study are:

1. To determine KPP scores and handrub practice of Malaysian hajj pilgrims before hajj.
2. To determine the association of handrub practice with intervention during hajj.
3. To determine the association between socio-demographic factors, knowledge and perception scores with handrub practice.
4. To determine the association between hand hygiene practices, intervention and mean differences of knowledge, perception and practices scores with occurrence of ILI.
5. To compare the knowledge and perception scores changes before and during hajj in intervention and control group

1.5 Work flow chart

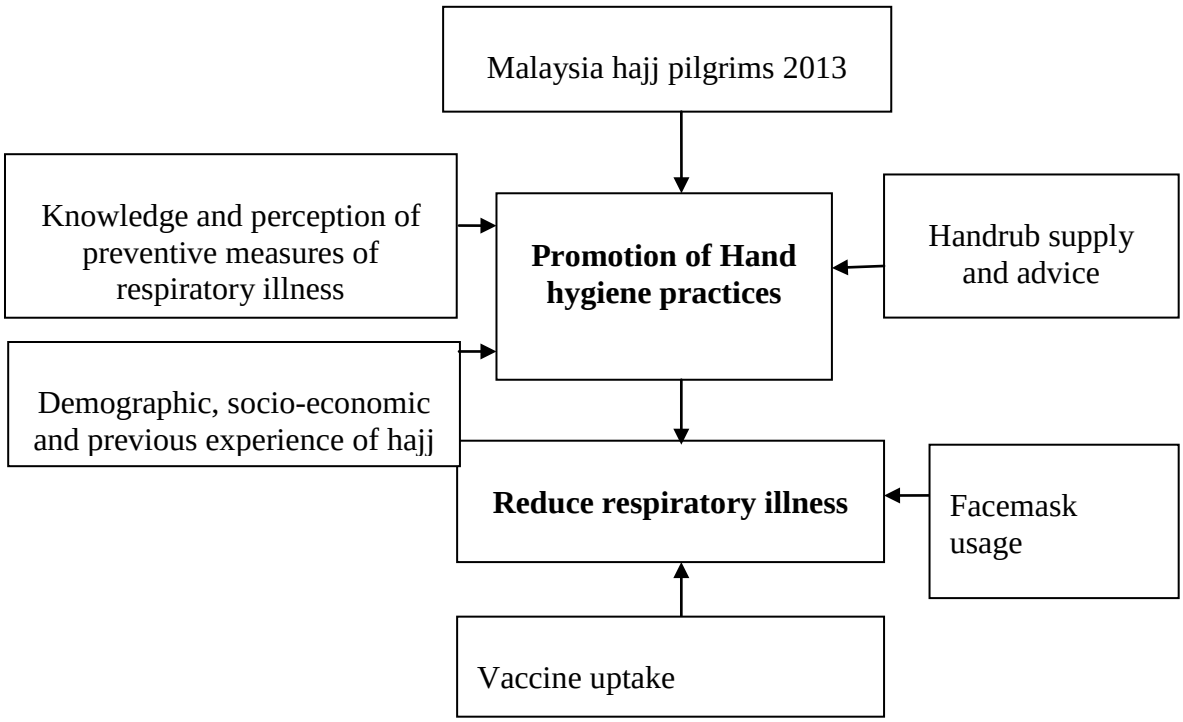

Figure 3 : Work flow chart

CHAPTER 2: METHODS AND MATERIALS

2.1 Research design

This is an open-label randomized control trial done from 15 September 2013 until January 2014.

2.2 Research location and time

Malaysia (Kompleks Tabung Haji Kelana Jaya), Mecca and Madinah, Saudi Arabia.

2.3 Reference population

All Malaysian hajj pilgrims 2013

2.4 Study population

Malaysian hajj pilgrims 2013 who transit in Kompleks Tabung Haji Kelana Jaya from 15 September until 19 September 2013:

- Intervention: part of Malaysian hajj pilgrims from KT 24, 25, 27, 30, 40,47
- Control: part of Malaysian hajj pilgrims from KT 31, 33, 35, 36, 44, 57, 66

2.4.1 Inclusion criteria

1. Adult Hajj pilgrims more than 18 years old
2. Able to comprehend Malay language
3. Willing to participate in pre and post-hajj study

2.4.2 Exclusion criteria

1. Ill person

2. Unable to read and write in Malay and had no assistance to complete the questionnaire

3. Staff or health-care workers or volunteer of Lembaga Urusan Tabung Haji

2.5 Sample size

Two-proportion formula was used to calculate the sample size for Objective 2 and Objective 3. Odds ratio was used to calculate the sample size for Objective 4 and Paired-t test was used to calculate the sample size for Objective 5.

Objective 2: Two- proportion formula

- α= 0.05, *Power* = 0.9, p_0 = 0.76, p_1 = 0.88, m = 1
- Calculated sample size : 213 x 2 = 426 .
- Add 10% drop-outs = 43.
- Total sample size = 469.
- p_0 = proportion of handrub practice among intervention group from literature (Larson EL *et al*; 2010)
- p_1 = proportion of handrub practice among control group from expert opinion

Objective 3: Two-proportion formula

- α= 0.05, *Power* = 0.9, p_0 = 0.49, p_1 = 0.34, m = 1
- Calculated sample size : 225 x 2 = 450
- Add 10% drop-outs = 45.
- Total sample size = 495.